USGS-NPS VEGETATION MAPPING PROGRAM

Classification of the Vegetation of Agate Fossil Beds National Monument

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1. VEGETATION SAMPLING AND CLASSIFICATION

Introduction

This report presents the results of the vegetation classification portion of the USGS-NPS Vegetation Mapping Program at Agate Fossil Beds National Monument. Sampling strategy and field methods are described for both plot and accuracy assessment sampling. The vegetation classification, field key to the vegetation types, and descriptions of each type are also included. As a supplement to this report, the raw plot data and accuracy assessment points are included as original field forms and in electronic form in the PLOTS database (a Microsoft Access database).

Methods

In general, the field methods used for developing the classification followed the standards outlined in the Field Methods for Vegetation Mapping document produced for this project. This began with the development of a preliminary vegetation classification based on literature review and an initial visit to the site. Names from the preliminary classification were used to identify polygons delineated from aerial photos. Due to the small size of the mapping area it was not deemed necessary to limit sampling to subsets of the whole area or to stratify it based on environmental or other factors. Although environmental information was not used to stratify the mapping area, data were collected from across a range of conditions on the mapping area to capture as much of the variation in the vegetation as possible. The field team performed a reconnaissance of the mapping area and the preliminary classification was refined before sampling began. Plot data were collected from across the entire mapping area, not just within the boundaries of Agate Fossil Beds NM. However, data collection outside the borders of the Monument was kept to a minimum to limit any possible complications with private landowners.

Within polygons, plots were subjectively placed in vegetation that was judged to be representative of the whole polygon. In some polygons this was difficult because dominant species were distributed in patches. In these cases, the patchiness was noted on the field forms. Total number of plots per vegetation type was related to areal coverage of each vegetation type, widespread types had more plots than those with limited distribution. The number of plots (39) varied from 0-5 per type, with an average of 3 per type. Plot size also varied with vegetation type. Woodland communities were sampled with 20 x 20 m plots while shrub and herbaceous dominated communities were sampled with 10 x 10 m plots.

Plots and observations by the field team were used to produce the final classification of Agate Fossil Beds NM. Field personnel organized the plots into groups based on vegetation structure and composition. Average cover of each species and vegetation stratum were computed. The plots were analyzed using an ordination technique, Detrended Correspondence Analysis (DCA), and a clustering algorithm, Unweighted Pair-Group Method Using Arithmetic Means (UPGMA). Because there were few plots per type and the locations of the plots were chosen to represent the variation of a type at Agate Fossil Beds NM, there was substantial variation within each type. In addition, the history of disturbance, especially in the floodplain of the Niobrara, has allowed invasive species to become established with the natural vegetation. These factors lessened the utility of the numerical analyses. Thus, the results of the numerical analyses were not used to derive the classification, but were compared to the subjective classification and any discrepancies in plot placement were examined.

Accuracy assessment data were collected following the procedures outlined in the Field Methods for Vegetation Mapping document produced for this project. The amount of data collected for each polygon was the same as that collected for observation points. 301 accuracy assessment points were collected from Aug. 26-Sept. 5, 1997. Points were placed along one of 30 transects crossing the mapping area.

Results

The classification of the vegetation at Agate Fossil Beds NM resulted in 13 types being defined, including one woodland type, two shrubland types, and 10 herbaceous types. Four of the herbaceous types are not placed within the National Vegetation Classification System (NVCS). Areas classified as these types are heavily dominated by exotic and/or invasive species. They are so disturbed that they cannot be accurately placed within the natural vegetation subgroup of the NVCS. Many types intergraded to some extent. Three were especially difficult to classify at times. *Calamovilfa longifolia - Andropogon gerardii* Herbaceous Vegetation and *Stipa comata - Bouteloua gracilis - Carex filifolia* were very similar in places. *Stipa comata - Bouteloua gracilis - Carex filifolia* Herbaceous Vegetation and *Schizachyrium scoparium - Bouteloua* (*curtipendula, gracilis*) - *Carex filifolia* Herbaceous Vegetation were also very difficult to distinguish in some places.

The classification of Agate Fossil Beds NM, placed within the NVCS, follows. A field key and descriptions for each of the types are included in later sections of this report.

II Woodland
- II.B Deciduous woodland
  - III.B.2 Cold-deciduous woodland
    - III.B.2.N Natural/semi-natural
      - III.B.2.N.b Temporarily flooded cold-deciduous woodland
        - POPULUS DELTOIDES TEMPORARILY FLOODED WOODLAND ALLIANCE
        - *Populus deltoides* - (*Salix amygdaloides*) / *Salix exigua* Woodland

III Shrubland
- III.B Deciduous shrubland
  - III.B.2 Cold-deciduous shrubland
    - III.B.2.N Natural/semi-natural
      - III.B.2.N.d Temporarily flooded cold-deciduous shrubland
        - SALIX EXIGUA TEMPORARILY FLOODED SHRUBLAND ALLIANCE
        - *Salix exigua* Shrubland [Provisional]
        - SYMPHORICARPOS OCCIDENTALIS TEMPORARILY FLOODED SHRUBLAND ALLIANCE
        - *Symphoricarpos occidentalis* Shrubland [Provisional]

V Herbaceous
V.A Perennial graminoid vegetation
V.A.5 Temperate or subpolar grassland

V.A.5.N Natural/semi-natural
V.A.5.N.a Tall sod temperate grassland
CALAMOVILFA LONGIFOLIA HERBACEOUS ALLIANCE
Calamovilfa longifolia - *Andropogon hallii* Herbaceous Alliance

V.A.5.N.c Medium-tall sod temperate or subpolar grassland
PASCOPYRUM SMITHII HERBACEOUS ALLIANCE
Pascopyrum smithii Herbaceous Vegetation [Provisional]

SCHIZACHYRIUM SCOPARIUM - BOUTELOUA CURTIPENDULA HERBACEOUS ALLIANCE
Schizachyrium scoparium - *Bouteloua* (*curtipendula, gracilis*) - *Carex filifolia* Herbaceous Vegetation

STIPA COMATA - BOUTELOUA GRACILIS HERBACEOUS ALLIANCE
Stipa comata - *Bouteloua gracilis* - *Carex filifolia* Herbaceous Vegetation

Stipa comata - *Bouteloua gracilis* Gravel Herbaceous Vegetation

V.A.5.N.k Seasonally flooded temperate or subpolar grassland
JUNCUS BALTICUS SEASONALLY FLOODED HERBACEOUS ALLIANCE
Juncus balticus Herbaceous Vegetation

V.A.5.N.l Semipermanently flooded temperate or subpolar grassland
TYPHA (ANGUSTIFOLIA, LATIFOLIA) - (SCIRPUS SPP.) SEMIPERMANENTLY FLOODED HERBACEOUS ALLIANCE
Typha latifolia Western Herbaceous Vegetation

V.A.5.C Cultural
Formation undefined
ALLIANCE UNDEFINED
Seeded Grassland Community

ALLIANCE UNDEFINED
Upland Disturbance Community

V.D Annual graminoid or forb vegetation
V.D.2 Temperate or subpolar annual grasslands or forb vegetation
V.D.2.C Cultural
Formation undefined
ALLIANCE UNDEFINED
Annual-dominated Floodplain Disturbance Community

Conclusions

The vegetation of Agate Fossil Beds NM was classified using the techniques established for the USGS-NPS Vegetation Mapping Program. Most of the vegetation types were placed in the NVCS. Due to disturbance in some areas, some of the vegetation at Agate Fossil Beds NM did not closely match the more general, national description of the community into which it was placed. In addition, a few types did not fit within the current NVCS and retained park-specific names and descriptions. It is expected that these will be placed within a national hierarchy as the NVCS is further developed.

The general methods outlined for the USGS-NPS Vegetation Mapping Program worked well in this project. There were several factors which contributed to this. The first was that the field team had aerial photographs with preliminary polygons already delineated when they began fieldwork. This made choosing plot and observation point locations much more efficient than would otherwise have been the case, especially given the limited environmental data available. The second was that the field personnel had been involved in mapping other parks for this project. This eliminated the need for training and made for more efficient use of field time. Finally, the small size and relatively gentle terrain of the mapping area made many aspects of the field effort easier.

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